

CHAPTER 4

PYROTECHNICS

Pyrotechnics are fireworks adapted to military use. The word *pyrotechny* means *the art of fire*. Therefore, pyrotechnics are items that produce their effect by burning, and are consumed in the process. Pyrotechnics, as used in the military, are items that produce a bright light for illumination or colored lights or smoke for signaling.

All Navy pyrotechnic devices contain combustible chemicals. When ignited, these chemicals generate a flame, flash, infrared radiation, smoke, sound display, or combinations of these effects for many purposes. Some of these effects are visual and audible signaling, area and target illumination, reference point marking, indication of practice weapon impact or fuze action, tracking, decoying, simulating, and smoke-screen generation.

Dye-marking devices are pyrotechnics and screening devices, even though their display is not the product of combustion. They are classed as pyrotechnic or screening devices because their end purposes are quite similar to those of the true pyrotechnic. Dye-marking devices are used to establish reference points on the surface of the water. In some cases, the dye is spread on the surface by explosive means.

Pyrotechnics generally function by means of an ignition train, similar to the explosive train of high-explosive ammunition.

For further information on pyrotechnics, you should refer to *Pyrotechnic, Screening, Marking, and Countermeasure Devices*, NAVSEA SW050-AB-MMA-010/NAVAIR 11-15-7.

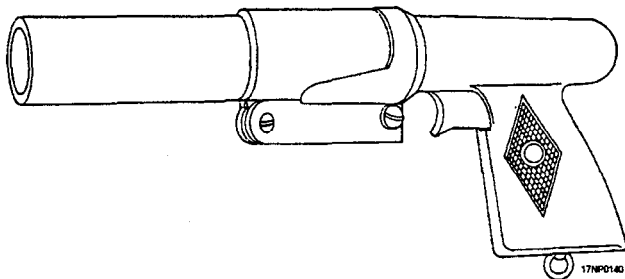


Figure 4-1.—Pyrotechnic pistol, Mk 1 Mod 0.

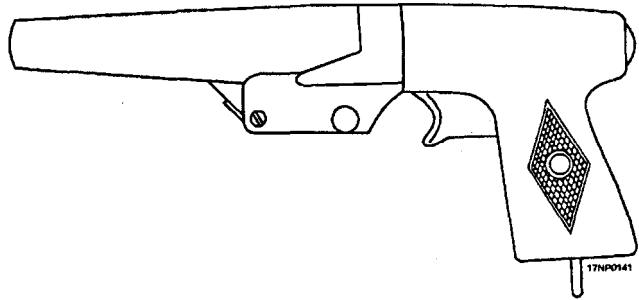


Figure 4-2.—Pyrotechnic pistol, Mk 5.

HAND-MANIPULATED SIGNALING DEVICES

LEARNING OBJECTIVE: *Identify the purpose and use of hand-manipulated signaling devices.*

Hand-manipulated devices are used for various signaling purposes, such as identification, recognition, warning, and distress.

PYROTECHNIC PISTOLS

Pyrotechnic pistols, Mk 1 Mod 0 (fig. 4-1), Mk 5 (fig. 4-2), and AN/M8 (fig. 4-3) are breechloaded, double-action, single-shot devices. The barrel is hinged to the frame and held in position by a breechblock or latch pin. All are fired by pulling a pistol type trigger.

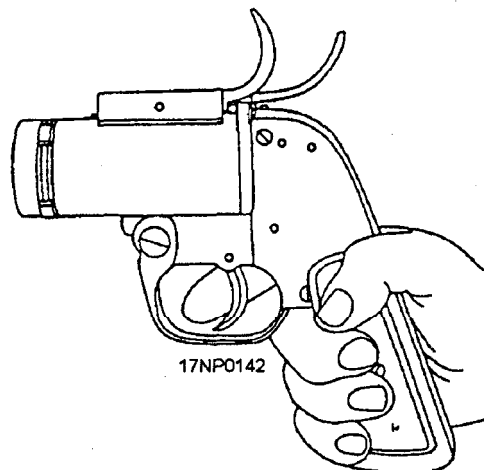


Figure 4-3.—Pyrotechnic pistol, AN/M8.

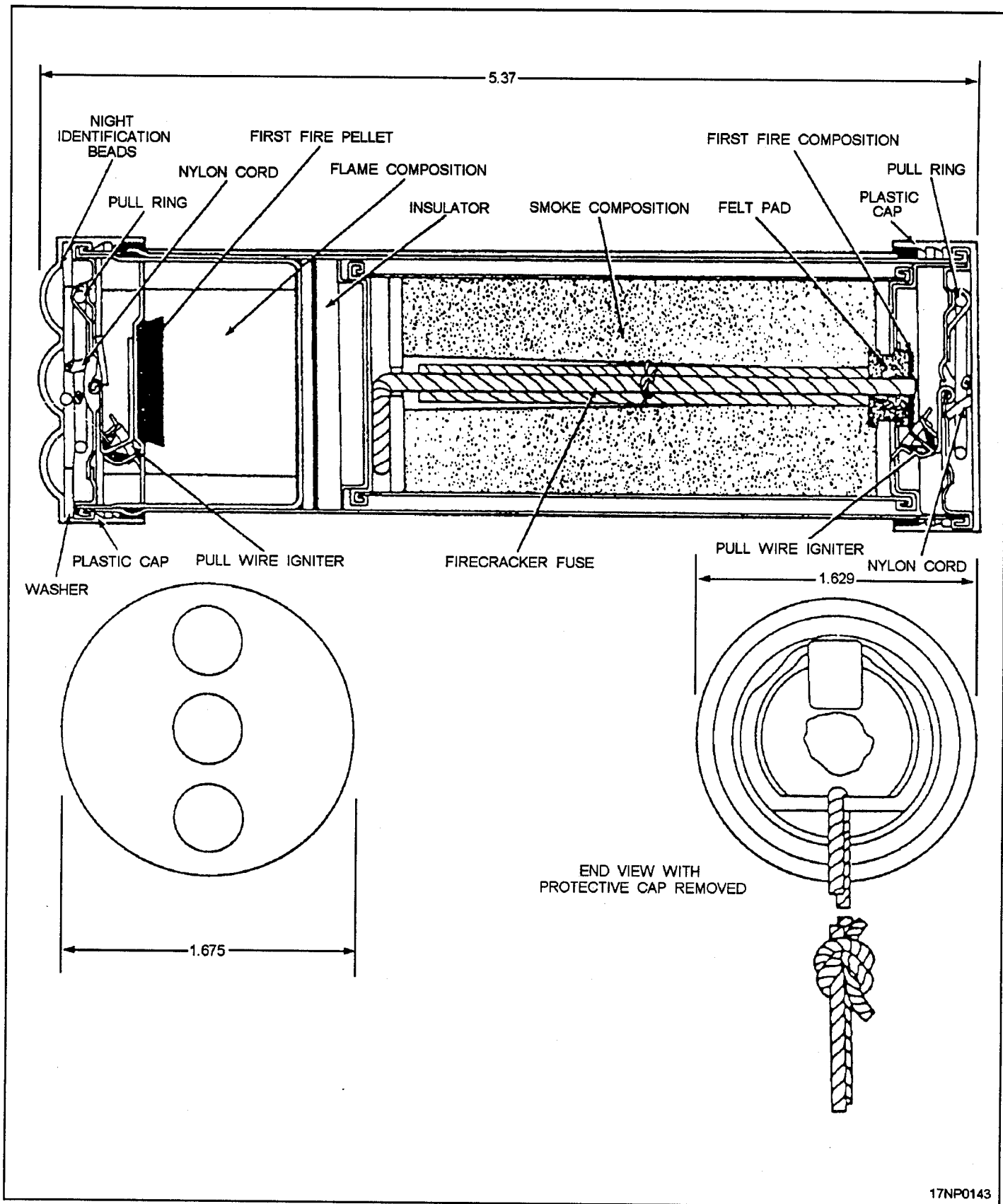


Figure 4-4.—Mk 13 Mod 0 marine smoke and illumination signal.

Table 4-1.—Pyrotechnic Pistols and Devices Launched

ITEM	DEVICES LAUNCHED
Mk 1 Mod 0 Pyrotechnic Pistol	Mk 2 Marine Smoke Signal
	Mk 1 Marine Illumination Signal
Mk 5 Pyrotechnic Pistol	Mk 2 Marine Illumination Signal
AN/M8 Pyrotechnic Pistol	Mk 1 Marine Illumination Signal
	Mk 2 Marine Smoke Signal
	Mk 50 Decoy Flare
	M11 Aircraft Signal

These devices are capable of firing various types of marine signaling devices. Refer to table 4-1.

MK 13 MOD 0 MARINE SMOKE AND ILLUMINATION SIGNAL

The Mk 13 Mod 0 (fig. 4-4) is used as a day or night signal by personnel on land or sea. Because of its small size and weight (6.4 ounces), it can be carried in life vests or flight suit pockets and on life rafts. This signal is especially adapted for use by aircrew personnel downed at sea.

The Mk 13 Mod 0 signal is a metal cylinder approximately 5 inches long and slightly more than 1.5 inches in diameter. It emits orange smoke for day use and red flame for night use. Burning time for each end is about 20 seconds. The protective plastic cap on the flame (night) end is molded so there are three prominent protrusions or beads across the face. You can identify this end by the sense of touch. The face of the cap at the smoke (day) end is smooth. A label on the outer surface around the whole body of the signal further identifies the smoke (day) and flame (night) ends. This label has instructions for its use.

To use the signal, remove the plastic cap from the end of the signal. Flip the pull ring over the signal rim and push downward to break the seal. After the seal is broken, NEVER point the signal toward your face or

body. Then, ignite the signal with a quick pull on the ring. Hold the signal firmly at arm's length and at a 45-degree angle to prevent burns from hot drippings. If you only use one end, douse the signal in water to cool it. Save the other end for later use.

MK 79 MOD 0 ILLUMINATION SIGNAL KIT

The Mk 79 Mod 0 signal kit (fig. 4-5) consists of a Mk 31 Mod 0 signal projector, a plastic bandoleer that holds seven Mk 80 Mod 0 signals, and an instruction sheet.

The kit is used by downed aircrew personnel as a distress signaling device. Because it is small and lightweight, personnel can carry it in pockets of flight suits or in life rafts. The projector aims and fires the signals. Each signal contains a single red star. On activation, this star is propelled upward to a height of between 250 and 650 feet. The star burns for a minimum of 4 1/2 seconds.

To operate the device, you cock the projector firing pin by moving the trigger screw to the bottom of the vertical slot, and slip it to the right so that it catches at the top of the angular slot. After cocking the firing pin, remove a signal from the bandoleer and mate the projector with the signal. Now, rotate the projector clockwise until the signal is seated. Hold the projector overhead, pointed at a slight angle away from your body. While firmly gripping the projector, fire the signal by slipping the trigger screw to the left, out of the safety slot and into the firing slot.

NOTE: This first step is very important because the signal is threaded and screwed into the end of the projector. If you don't cock the projector before screwing in the signal, the firing pin could be forced into the primer of the signal, possibly firing the signal prematurely.

REVIEW NUMBER 1

- Q1. Navy pyrotechnic devices contain what type of material ?*
- Q2. Why are dye-marking devices classified as pyrotechnic devices?*
- Q3. When used during the day, what color smoke is emitted from the Mk 13 Mod 0 marine smoke and illumination signal?*
- Q4. What is the burning time for each end of the Mk 13 Mod 0 signal?*

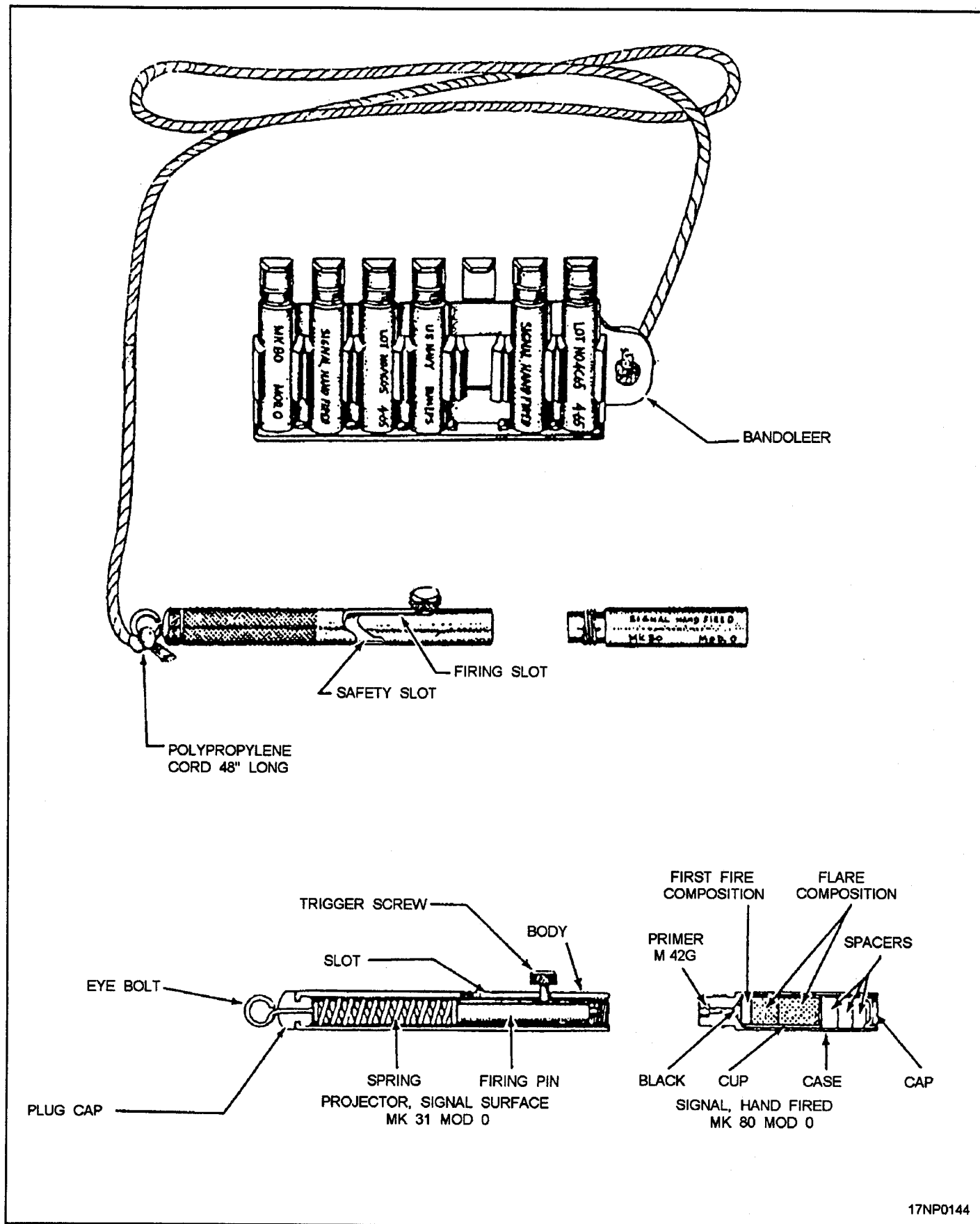


Figure 4-5.—Mk 79 Mod 0 illumination signal kit.

- Q5. You can identify the night end of the Mk 13 Mod 0 signal by the _____.
- Q6. List the components of the Mk 79 Mod 0 illumination signal kit.
- Q7. When you activate the Mk 79 Mod 0 signal kit, the star is propelled upward to a height of _____.
- Q8. What is the burn time of the Mk 79 Mod 0 star?

AREA AND TARGET ILLUMINATING DEVICES

LEARNING OBJECTIVE: *Identify the purpose and use of area and target illuminating devices to include components and operation.*

The illuminating devices discussed in this chapter are designed to be launched or dropped from aircraft. Aircraft flares are used to illuminate large areas for bombardment, reconnaissance, emergency aircraft landing, or any other purpose where a high-intensity light is required.

MK 45 MOD 0 AIRCRAFT PARACHUTE FLARE

The aircraft-launched Mk 45 Mod 0 aircraft parachute flare (fig. 4-6) is used for night illumination

of surface areas in search-and-attack operations. It replaces the Mk 24 Mods aircraft parachute flare.

The Mk 45 Mod 0 aircraft parachute flare is an AUR, complete with the candle, parachute assembly, and fuze. All components are encased in a cylindrical aluminum body approximately 36 inches long (including the fuze assembly) and 4.9 inches in diameter.

The Mk 364 Mod 0 fuze is shipped installed in the flare. Its sole purpose is to control the altitude of flare ejection in relation to launch altitude. It does not directly control candle ignition. The fuze has 15 functional settings and 1 SAFE setting. The functional settings are at 1,000-foot intervals from 1,000 to 14,000 feet, except that 1 minimum setting of 500 feet is provided. The fuze-setting mechanism consists of a single yellow dial indicator you can easily turn by hand—clockwise for setting and counterclockwise for safing. A spring-loaded detent holds the dial indicator at a selected setting or at SAFE, and prevents accidental changing of the setting by vibration forces.

The Mk 45 Mod 0 flare is launched from an available external launching system, such as bomb racks. The launching system provides a 14-inch suspension, or the flare is launched from an aircraft by hand. It is usually dispenser launched. A drogue tray

WEIGHT: 28 LB.
LENGTH: 36 IN.
DIAMETER: 4.9 IN.
SUSPENSION PROVISIONS:

1. TWO SUSPENSION BANDS (14 INCH SEPARATION) ON MER OR TER
2. SUU-44/A FLARE DISPENSER

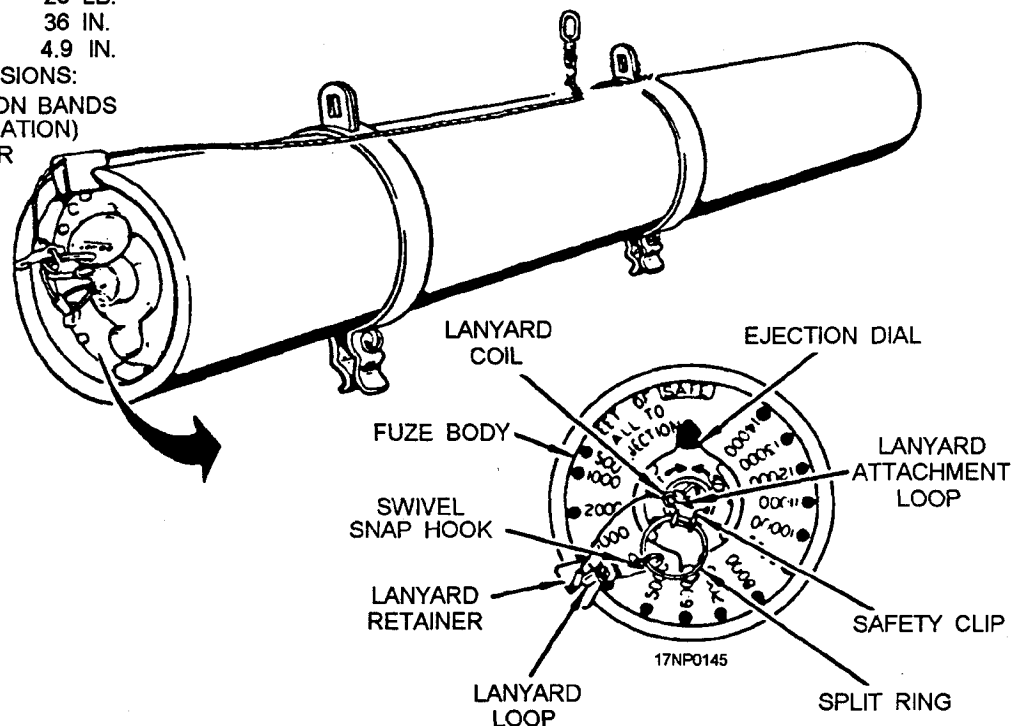


Figure 4-6.—Mk 45 Mod 0 aircraft parachute flare.

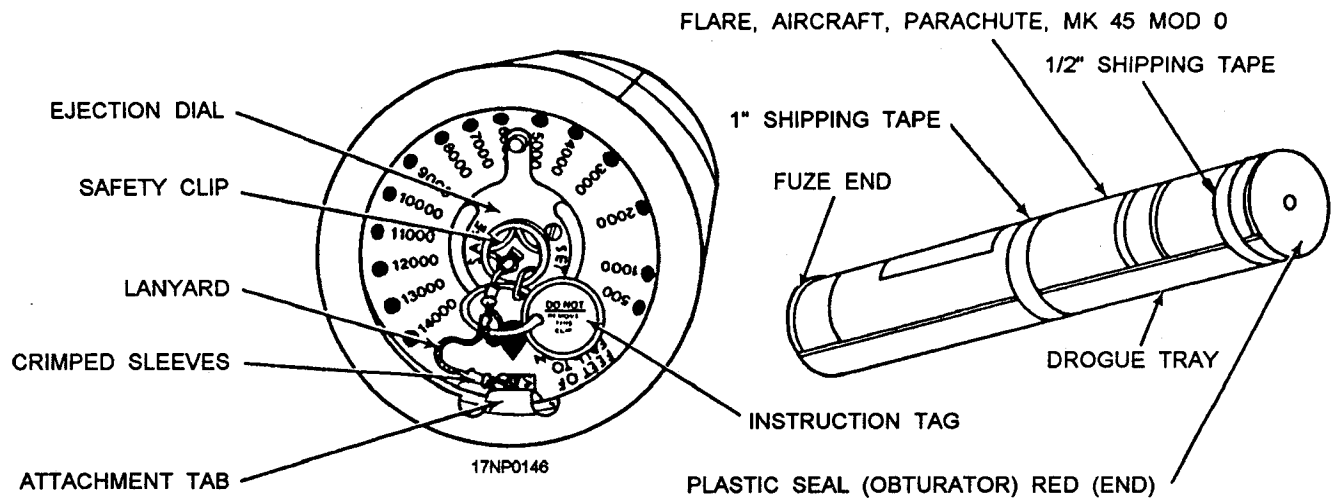


Figure 4-7.—Mk 45 Mod 0 aircraft parachute flare with drogue tray.

(fig. 4-7) is used to dispenser launch the flare. Normally, the drogue tray is configured to the flare at the time of manufacture. The drogue tray is a quarter-round, lightweight, aluminum channel with perpendicular ends. The fuze end has an attachment tab and a circular opening to allow for flare fuze setting. It is attached to the safety clip by a lanyard. The opposite end is solid and has a red plastic seal that acts as a pressure seal for dispenser ejection cartridge gases. Flares and trays are loaded into the dispenser as a unit.

Regardless of launch method, the flare is initiated by exerting pull on the lanyard. When the lanyard is pulled, it snaps the safety clip from its position over the

toggle. A force of 18 to 35 pounds pulls the internal disconnect completely out of the fuze mechanism, allowing the spring-loaded striker to strike the primer. The primer ignites a fixed, 2-second delay element and drives the plunger into the ejection time-delay fuze at a point determined by the selected setting. After 2 seconds, the delay element ignites black powder in the plunger. Ignition is transferred through a perforation in the plunger to the time-delay fuze. After the preset delay, the fuze ignites the expellant. The expellant forces off the aluminum end cap and expels the candle and the parachute assembly from the flare case with considerable force.

REVIEW NUMBER 1 ANSWERS TO QUESTION Q1. THROUGH Q8.

- A1. Navy pyrotechnic devices contain combustible chemicals.
- A2. Dye-marking devices are classified as pyrotechnic devices because they are used for about the same purpose as the true pyrotechnic.
- A3. Orange smoke is emitted from the Mk 13 Mod 0 marine smoke and illumination marker when it is used during the day.
- A4. The burning time for each end of the Mk 13 Mod 0 signal is 20 seconds.
- A5. You can identify the night end of the Mk 13 Mod 0 signal by the three prominent beads across its face.
- A6. The components of the Mk 79 Mod 0 illumination signal kit include the Mk 31 Mod 0 signal projector, a plastic bandoleer, and an instruction sheet.
- A7. When you activate the Mk 79 Mod 0 signal kit, the star is propelled upward to a height of 250 to 650 feet.
- A8. The burn time of the Mk 79 Mod 0 star is a minimum of 4 1/2 seconds.

Upon opening, the main parachute pulls on the cables of the suspension/ignition system. The shorter cable pulls the release pin from the igniter assembly, cocking and releasing the firing pin so that it strikes the primer. The primer ignites an ignition pellet, which, in turn ignites the magnesium candle. The burning candle is then suspended on the fully deployed main parachute. When the candle approaches the end of its burning time, its heat activates the explosive bolt. (Ten of the eighteen shroud lines are attached to the explosive bolt.) Release of these shroud lines causes the parachute to collapse and flutter to the ground.

LUU-2B/B AIRCRAFT PARACHUTE FLARE

The LUU-2B/B flare is the same size as the Mk 45 flare. It is 36 inches long, 4.9 inches in diameter, and weighs about 30 pounds. The flare is supplied only as an AUR, and it is shipped assembled with drogue trays for dispenser launch. The flare is hand launched, or configured for launching from IMER or ITER aircraft bomb racks. It replaces the Mk 24 Mods and Mk 45 Mods aircraft parachute flares.

Components

The LUU-2B/B flare (fig. 4-8) has four major components:

WEIGHT:	30 LB.	CANDLEPOWER	2,000,000 LUU-2B/B
LENGTH:	36 IN.		1,600,000 LUU-2A/B
DIAMETER:	4.9 IN.		
SUSPENSION PROVISIONS:	14 IN.		

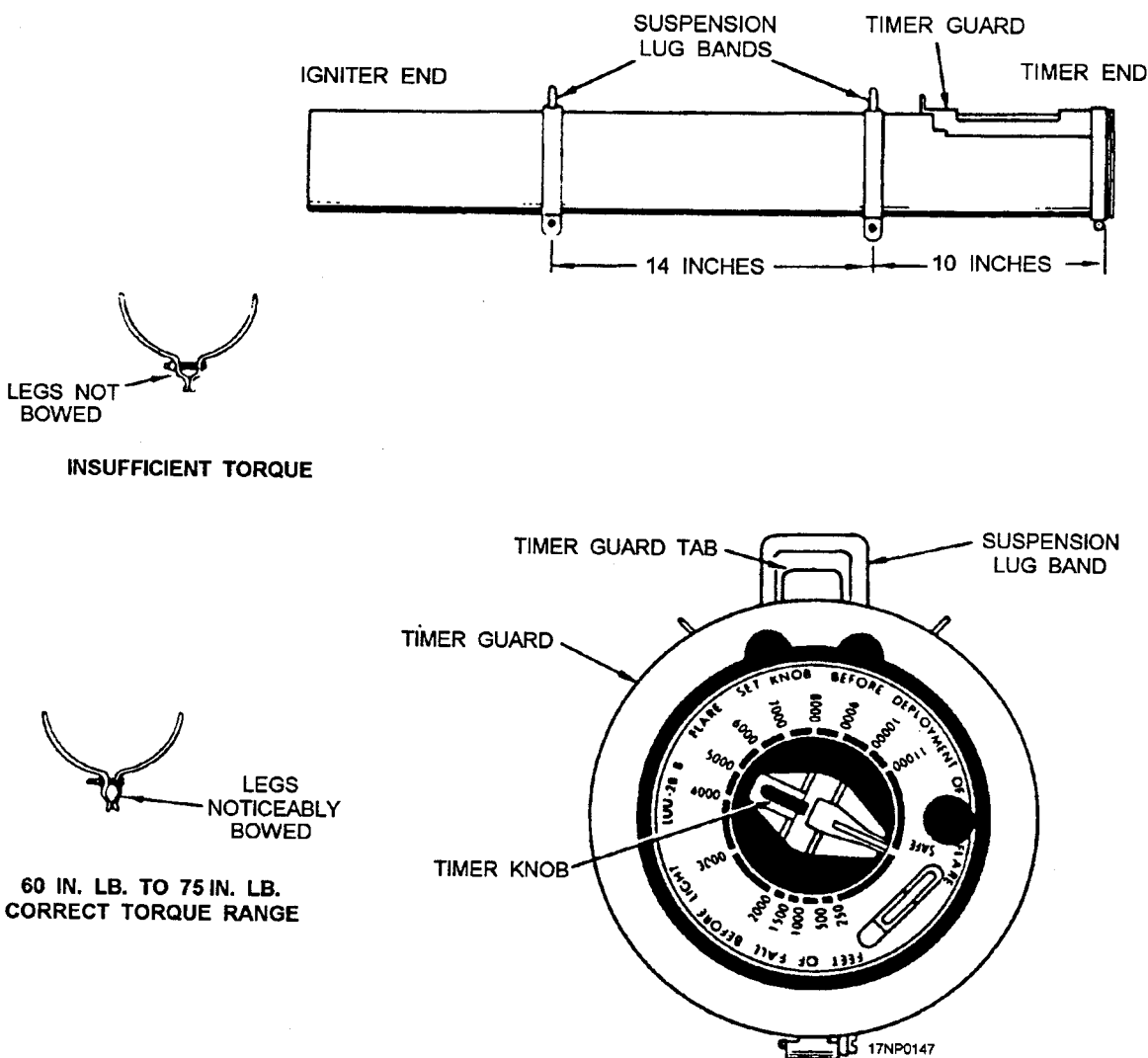


Figure 4-8.—LUU-2B/B aircraft parachute flare.

1. The mechanical timer assembly
2. The parachute suspension system
3. The out-of-line igniter
4. The case assembly with the tamped candle

The mechanical timer assembly consists of a mechanical timer and related hardware in a Lexan plastic housing. The nonexplosive mechanical timer functions like the explosive Mk 364 fuze on the Mk 45 flare. The mechanical timer is a three-gear timer, powered by a torsional mainspring. A phosphorescent plastic decal with calibrated markings from 250 to 11,000 feet of fall is located on the face of the timer cover. A white, plastic, dial timer knob is used to set the desired drop distance. Settings of 150,500, and 1,000 to 11,000 feet can be selected. A safe setting is also provided.

An 18-foot diameter cruciform-shaped canopy parachute suspension system is used for good stability. The riser cables connect the parachute to a bulkhead. The bulkhead separates the parachute compartment from the remainder of the flare assembly. One cable is attached to an explosive bolt for parachute dump at candle burnout, just like the Mk 45 flare.

In the ignition system, a lanyard is attached to one of the parachute riser cables. This lanyard is threaded through the bulkhead and past the candle in an internal raceway along the side of the aluminum case. This leads to the ignition assembly in the ignition housing near the candle's face. The lanyard is attached to a triggering mechanism, which consists of the out-of-line igniter (OLI-2/A). Upon ignition, the firing pin initiates the pyrotechnic firing train.

The aluminum case assembly contains a tamp-cast illuminating candle that consists of a composition of magnesium, sodium nitrate, and a polymer binder. The flare is designed so the outer aluminum case is partially consumed during candle burning.

Operation

A lanyard is attached to the timer knob on the flare timer during flare uploading procedures. The lanyard is also connected to the flare drogue tray or bomb rack, depending on the launch configuration. At launch, the timer knob is pulled out of the timer (requires approximately 30 pounds of force) by the lanyard, starting the clock mechanism. After the preset time (drop distance) ends, the three locking pawls in the timer assembly release, retracting and releasing the timer

assembly. A spring, located between the timer assembly and the packaged parachute, expels the timer assembly, which, in turn, initiates removal of the parachute from the flare case. When the cord breaks, it separates the timer assembly from the parachute. As the parachute system deploys and its main cables are pulled taut, the ignition lanyard is pulled to activate the ignition system. The ignition lanyard must exert a pull force in excess of 90 pounds to pull the slider assembly in line. This, in turn, releases the firing pin against the primer. The primer ignites a propellant wafer that produces sufficient heat for candle ignition. Pressure buildup during candle ignition blows off the igniter housing, and the candle power reaches a nominal value. Just before candle burnout, the explosive bolt functions to release one of the suspension cables, causing the parachute to dump.

The LUU-2B/B flare has several advantages over the Mk 24 and Mk 45 flares. The most important advantage is that the candle is not ejected from the case on the LUU-2B/B. Only the parachute is removed from the case. This is accomplished by a mechanical timer instead of an explosive fuze, as is done in the Mk 24 and Mk 45. Therefore, if the timer knob should be accidentally pulled during handling when the timer is not on the SAFE setting, the timer and release mechanisms can be forcibly hand-held onto the flare housing to prevent ejection of the timer and release mechanisms. When the timer completes its cycle, the timer mechanism can be taped on the flare housing and marked for disposal. If the timer is ejected from the flare and a portion of the parachute comes out of the housing, the parachute can be stuffed back into the housing, taped, and marked for disposal.

Another advantage of the LUU-2 B/B flare is the increased pull force on the parachute lanyard to initiate the ignition sequence. If the parachute should accidentally deploy on the flight deck/line, the opening shock from deck winds or jet blast is not sufficient to ignite the candle.

REVIEW NUMBER 2

- Q1. *What is the length and diameter of the Mk 45 Mod 0 aircraft parachute flare ?*
- Q2. *What fuze is used with the Mk 45 Mod 0 flare?*
- Q3. *What are the settings of the Mk 45 Mod 0 flare?*
- Q4. *List the component that holds the dial indicator at a selected setting or at SAFE.*

- Q5. What amount of force needs to be exerted to pull the internal disconnect completely out of the fuze mechanism ?
- Q6. What is the approximate weight of the LUU-2B/B aircraft parachute flare?
- Q7. The components of the LUU-2B/B flare are _____.
- Q8. What is the minimum drop distance setting of the LUU-2B/B flare?
- Q9. What is the diameter of the parachute suspension system?
- Q10. At launch, the timer knob is pulled off of the timer by what amount of force on the lanyard?
- Q11. Using the LUU-2B/B flare instead of the Mk 45 Mod 0 flare is more advantageous because the LUU-2B/B flare candle _____.

AIRCRAFT-LAUNCHED SMOKE AND FLAME MARKING DEVICES

LEARNING OBJECTIVE: *Identify the physical and functional description of aircraft-launched smoke and flame marking devices. Recognize the methods used to launch them.*

Smoke and flame marking devices are pyrotechnic devices dropped on the ground or on the water's surface

PHYSICAL CHARACTERISTICS:

WEIGHT: 3.7 LB.
 LENGTH: 18.5 IN.
 DIAMETER: 3 IN.

to emit smoke and/or flame. Reference points established by these devices serve a variety of purposes. They can be used to determine wind direction and approximate velocity, mark the location on the surface for emergency night landings, establish an initial contact point for continued search for a submarine, or locate target areas in antisubmarine warfare.

MK 25 MODS 2 AND 3 MARINE LOCATION MARKER

The Mk 25 Mods 2 and 3 (fig. 4-9) marine location markers are launched from aircraft or surface craft. They are launched from aircraft to provide day or night reference points for marking the course of enemy submarines in antisubmarine warfare operations. They are suitable for any type of sea-surface reference-point marking that calls for both smoke and flame for a period of 10 to 20 minutes. Mods 2 and 3 function identically. The only significant difference is that Mod 2 contains two seawater-activated batteries and two related squibs while Mod 3 contains a single battery and squib.

Physical Description

The Mk 25 marker consists of a cylindrical outer tube about 18.5 inches long and 2.9 inches in diameter. A valve assembly is fitted into the projecting chimney at the marker's nose end. The smoke and flame are emitted from this opening. At the opposite end is a

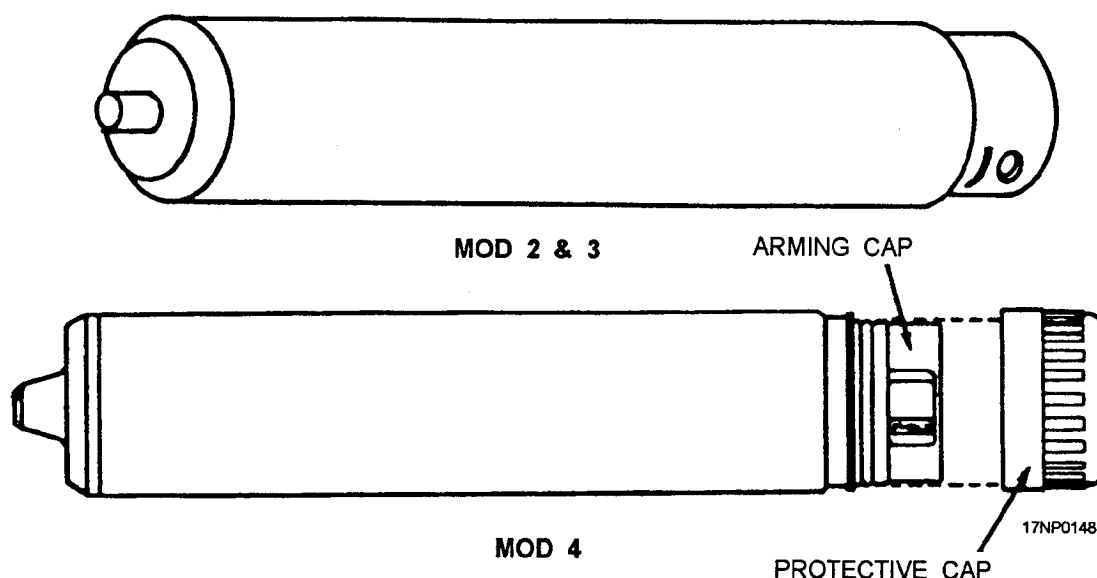


Figure 4-9.—Mk 25 marine location marker.

heavier aluminum base assembly to which the outer tube is crimped. The heavy base end causes the marker to float in the water with the chimney out of the water and the base in the water.

Within the base assembly is a Mk 72 Mod 0 seawater-activated battery (two batteries in the Mod 2). The battery is shielded from water contact by two plugs fitted into 1/2-inch holes on two opposite sides of the base assembly. A rigid cover (arming plate), held in place by a retainer ring, is recessed into the base end. An arrow in the center of the arming plate indicates its safe or armed position. The words SAFE and ARMED are stamped into the base rim. Also, a machined notch in the rim at the armed position helps during night use. When the arming plate is in the safe position, it physically blocks the base plugs internally to prevent them from being accidentally pushed in. When in the armed position, the arming plate no longer blocks the base plugs, allowing them to be pushed in at the appropriate time. A black rubber G-ring circles the base

assembly approximately 1/4 inch from the crimp, which holds the outer case.

Functional Description

To activate the seawater battery, the base plugs are pushed in before the marker is actually launched. The marker is ignited by an electric squib, and power is supplied by the seawater-activated battery (two batteries and two squibs in Mod 2). When the marker enters the water, seawater enters the battery cavity and serves as an electrolyte, causing the battery to produce a current that activates the squib. The squib ignites the starter mix, which, in turn, ignites the red phosphorous pyrotechnic composition. Gas buildup forces the valve assembly from the chimney in the nose, and yellow flame and white smoke are emitted. Burning time averages 13.5 to 18.5 minutes. Although this marker is normally used in seawater, it can be used in inland bodies of fresh water by using table salt and following the procedures outlined in *Pyrotechnic, Screening, Marking, and Countermeasure Devices*, NAVSEA SW050-AB-MMA-010/NAVAIR 11-15-7.

REVIEW NUMBER 2 ANSWERS TO QUESTIONS Q1. THROUGH Q11.

- A1. *The Mk 45 Mod 0 aircraft parachute flare is 36 inches long and approximately 4.9 inches in diameter.*
- A2. *The Mk 364 Mod 0 fuze is used with the Mk 45 Mod 0 flare.*
- A3. *The Mk 45 Mod 0 flare has 15 functional settings, from 1,000 to 14,000 feet in 1,000-foot increments. There is one minimum setting of 500 feet.*
- A4. *A spring-loaded detent holds the dial indicator at a selected setting or at SAFE.*
- A5. *The Mk 45 Mod 0 flare is initiated by exerting a force of 18 to 35 pounds to pull the internal disconnect completely out of the fuze mechanism.*
- A6. *The LUU-2B/B aircraft parachute flare weighs about 30 pounds.*
- A7. *The components of the LUU-2B/B flare are the mechanical timer assembly, the out-of-line igniter, the parachute suspension system and the case assembly with tamped candle.*
- A8. *The minimum drop distance setting of the LUU-2B/B flare is 150 feet.*
- A9. *The diameter of the parachute suspension system is 18 feet.*
- A10. *At launch, the timer knob is pulled off of the timer by approximately 30 pounds of force on the lanyard.*
- A11. *Using the LUU-2B/B flare instead of the Mk 45 Mod 0 flare is more advantageous because the LUU-2B/B flare candle is not ejected from the case of the LUU-2B/B.*

Launching Methods

Currently, there are two methods of launching the Mk 25 marker—by hand or by sonobuoy launcher. To launch by hand, rotate the base arming plate clockwise to the armed position. Push the base plugs into the battery cavity, located in the marker base, and throw the marker into the water. It functions as previously discussed.

If the base plugs (one or both) of a marker are disturbed so the watertight integrity of the battery cavity is compromised and the marker is not launched immediately, a marine marker adapter kit (Mk 34 Mod 0) must be installed. The Mk 34 Mod 0 adapter kit is also used when the marker is launched from sonobuoy launchers. The adapter kit fits over the base end of the marker, and, when properly installed, seals the battery cavity. The adapter kit is installed by rotating the marker base arming plate to the armed position and pushing the base plugs into the battery cavity. Remove the black G-ring and install the adapter kit around the marker base so the seal plugs on the leaf-spring ends cover the holes in the battery cavity. Insert the U-pin to hold the

adapter in place. To hand-launch a marker with a Mk 34 adapter kit installed, remove the U-pin and the adapter and throw the marker into the water.

Before launching the Mk 25 marker from sonobuoy launchers, you should install a Mk 34 adapter kit (fig. 4-10) on the marker. The adapter kit provides a safe environment for the marker until the last possible moment before launch. Because of the physical difference in size between the Mk 25 marker and the sonobuoy launch tubes, a sonobuoy launch container (SLC) and spacer assembly (fig. 4-10) is used to launch the Mk 25 marker from a sonobuoy launcher.

The Mk 25 marker, with the Mk 34 adapter kit installed, is installed into the cavity half of the split foam spacer assembly section with the U-pin of the Mk 34 adapter in the UP position. Then, remove the U-pin and place the other half of the split foam spacer assembly section over the marker, which completely encloses the marker. The foam spacer assembly containing the marker is then installed into the SLC against the obturator. Foam pads are installed, and the end cap is locked into slots in the SLC, retaining the assembly

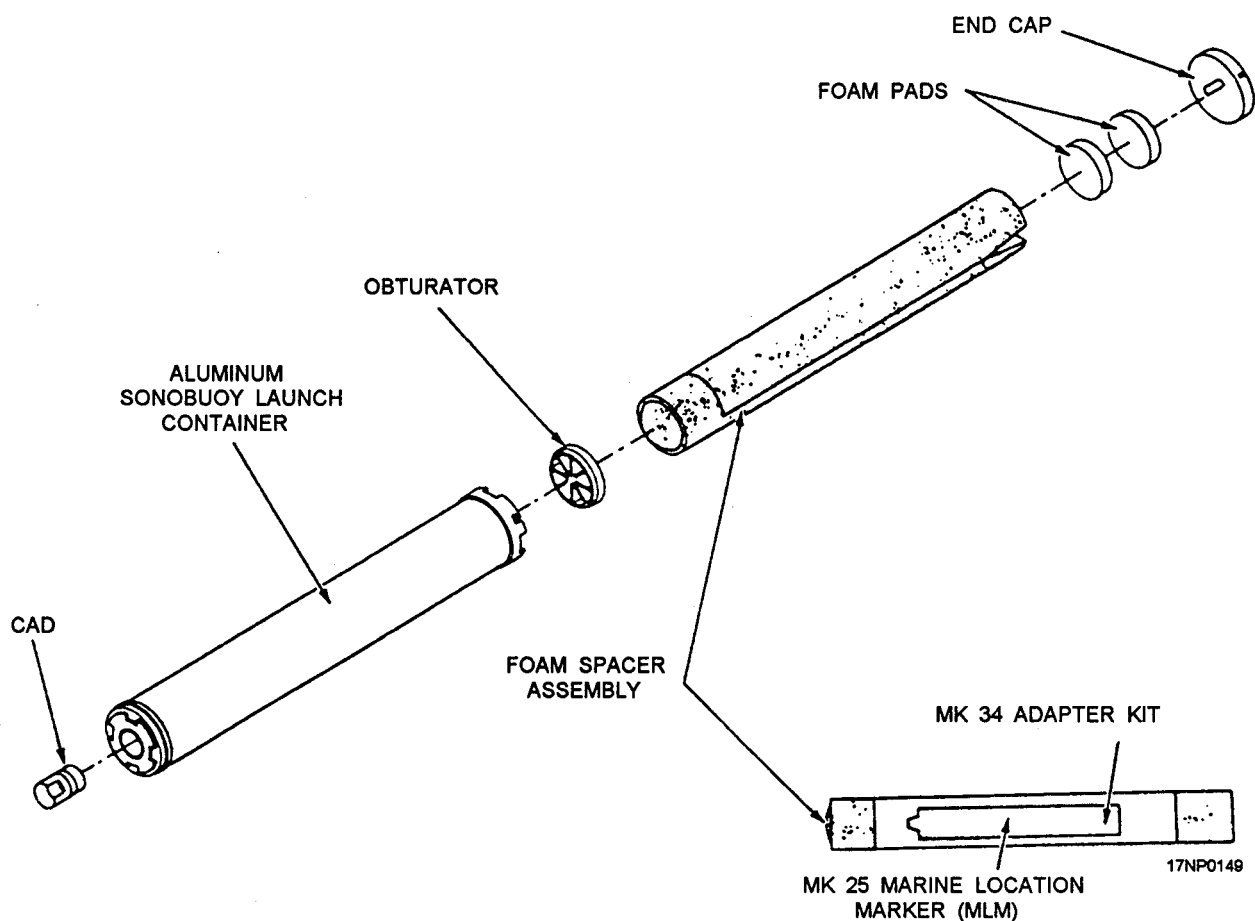


Figure 4-10.—Spacer assembly and sonobuoy launch container.

inside the SLC. A JAU-1/B cartridge is installed in the SLC, and the loaded SLC is installed in the sonobuoy launcher aboard the aircraft.

To launch the Mk 25 marker, the JAU-1/B cartridge is initiated through the aircraft circuitry. It develops sufficient gas pressure inside the SLC to force off the SLC end cap and expel the foam spacer assembly containing the Mk 25 marker. Once out of the SLC, the split foam spacer assembly is separated by the airstream, freeing the marker. The airstream then separates the Mk 34 adapter kit from the marker, allowing them to fall to the water as separate units. Upon entry into the water, the marker functions as previously discussed.

MK 58 MOD 1 MARINE LOCATION MARKER

The Mk 58 Mod 1 marine location marker (fig. 4-11) is designed for day or night use in any condition calling for long-burning, smoke and flame reference-point marking on the ocean's surface. In addition to being used for antisubmarine warfare, it is used for search-and-rescue operations, man-overboard markings, and as a target for practice bombing at sea. The marker produces a yellow flame and white smoke for a minimum of 40 minutes and a maximum of 60 minutes. It is visible for at least 3 miles under normal operating conditions.

Physical Description

The Mk 58 Mod 1 marine location marker consists of a cylindrical tin can approximately 21.78 inches long and 5.03 inches in diameter. The can contains two pyrotechnic candles of a red phosphorus composition. The ignition end of the marker has three holes—two for smoke and flame emission and one for water to enter the Mk 72 Mod 1 seawater-activated battery. Adhesive foil disks hermetically seal the two emission holes. A reinforced adhesive foil strip with a rectangular pull ring hermetically seals the battery cavity hole. The adhesive foil seals are protected during handling and shipping by a replaceable polyethylene protective cover.

Launching Methods

The Mk 58 Mod 1 marker may be hand launched, externally launched from suitable aircraft bomb racks by using breakaway suspension bands, or launched from sonobuoy launchers by using a sonobuoy launcher container (SLC) and the appropriate foam spacer. No matter how the marker is launched, the protective cover, the pull ring, and reinforced adhesive foil strip over the battery's cavity are removed.

When launching the marker from a sonobuoy launcher, you remove the protective cover and pull ring and reinforced adhesive foil strip. Then, load the marker onto the bomb rack. After securing the marker

WEIGHT: 12.8 LB.
LENGTH: 21.5 IN.
DIAMETER: 4.9 IN.
SUSPENSION PROVISIONS: BANDS (BASB)

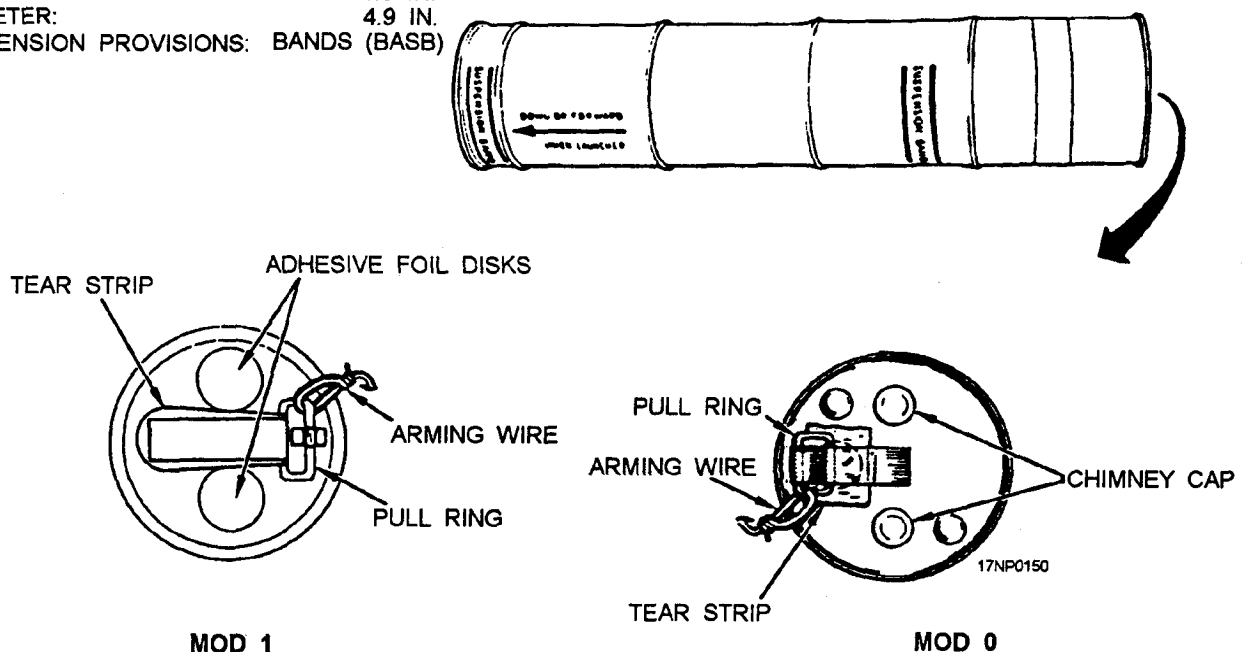


Figure 4-11.—Mk 58 Mod 0/1 marine location marker.

to the bomb rack, attach the pull ring to an arming wire, which is attached to the bomb rack. When the marker is released from the bomb rack, the arming wire retains the pull ring and removes the foil strip covering the battery's cavity. When submerged, the Mk 72 Mod 1 battery is activated by seawater. Current from the battery initiates a Mk 13 electric squib, which ignites the starter composition of the first pyrotechnic candle. The composition ignites the starter pellet, which, in turn, ignites the first candle. When the first candle is nearly burned out, its heat ignites the transfer time fuze which carries ignition to the second candle starter composition. This starter composition initiates the second pyrotechnic candle.

REVIEW NUMBER 3

- Q1. What is the burn time of the Mk 25 Mods 2 and 3 marine location markers?
- Q2. The Mk 25 Mods 2 and 3 marine location markers function in the same way. Describe the difference between them.
- Q3. What is the purpose of the heavy aluminum base assembly crimped to the outer tube?
- Q4. List the methods used to launch the Mk 25 and Mods marine location markers.
- Q5. What adapter kit is used when the Mk 25 and Mods marine location markers are launched from sonobuoy launchers?

	CHAFF PACKAGE	MJU-8/B MJU-8A/B	MJU-22/B	SM-875/ALE
LENGTH:	5.8 IN.	5.8 IN.	10.55 IN.	3.828 IN.
DIAMETER:	1.4 IN.	1.4 IN.	1.4 IN.	1.4 IN.

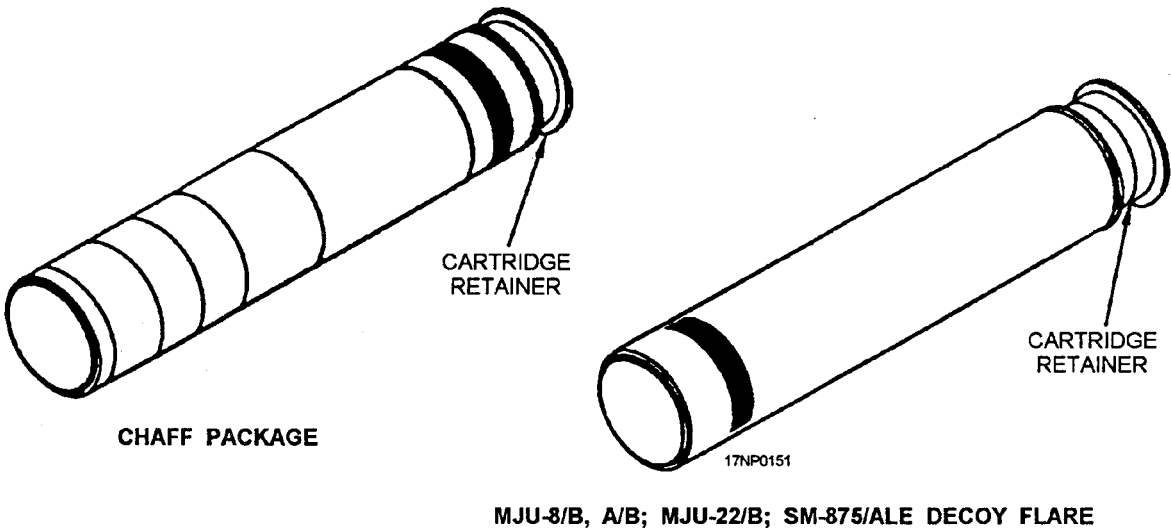


Figure 4-12.—Mk 46 Mod 1, MJU-8/B, A/B, MJU-22/B, SM 875/ALE and chaff package.

- Q6. List the uses of the Mk 58 Mod 1 marine location marker.
- Q7. The Mk 58 Mod 1 marker produces a yellow flame and white smoke for what length of time?
- Q8. Under normal conditions, the flame and/or smoke of the Mk 58 Mod 1 marker is visible for _____.
- Q9. List the methods used to launch the Mk 58 Mod 1 marine marker
- Q10. What seawater-activated battery is used with the Mk 58 Mod 1 marker?

DECOYING DEVICES

LEARNING OBJECTIVE: Identify the purpose and use of decoy devices.

Decoy flares are dispensed from launching mechanisms on aircraft. They are fired during evasion tactics when threatened by enemy heat-seeking missiles.

The Mk 46 Mods 1, 1A, and 1C decoy flares are loaded into and launched from either the AN/ALE-39 dispensing set or the AN/ALE-37A chaff dispenser. The decoy flare (fig. 4-12) consists of a cylindrical aluminum case about 5.8 inches long and 1.42 inches in diameter. The base end of the flare is flanged to a maximum diameter of 1.495 inches to fit the counterbore in the chamber of the dispenser. The end

of the flare case opposite the flanged base is closed with an aluminum closure disk.

When properly installed in the chamber of a dispenser, the cartridge retainer fits snugly over and around the firing end of a corresponding Mk 131 impulse cartridge. When the cartridge is fired, gas pressure causes the hammer to move into the adapter, locking the adapter and the piston together. Gases from the fired cartridge expand to exert a pushing force against the piston. This removes the closure disk and ejects the flare grain. As the piston strikes the piston stop, the adapter to which the pull wire is firmly attached separates from the igniter cup. Then, the adapter travels with the flare grain. This action causes the igniter to move over the friction material on the crinkled end of the pull wire, igniting the ignition composition. Flame flashes through the longitudinal hole in the flare grain and ignites the first-fire composition in both the

longitudinal hole and the cross hole. The first-fire composition ignites the flare grain on all surfaces.

The flare is rendered safe during normal handling operations by the segmented adapter. If the closure disk is accidentally displaced, the entire grain and the igniter assembly slips out of the flare case without igniting. The device arms only after an impulse cartridge is fired and bends the sharpened edges of the adapter so it is locked to the piston.

PRACTICE BOMB SIGNAL CARTRIDGES

LEARNING OBJECTIVE: *Identify the purpose and use of practice bomb signal cartridges.*

Practice bomb signal cartridges are used for day and night operations and as a visual indication of bomb

REVIEW NUMBER 3 ANSWERS TO QUESTIONS Q1. THROUGH Q10.

- A1. *The burn time of the Mk 25 Mods 2 and 3 marine location markers is between 10 and 20 minutes.*
- A2. *The Mk 25 Mods 2 and 3 marine location markers function in the same way, Mod 2 contains two saltwater-activated batteries and two related squibs. Mod 3 contains one battery and one squib.*
- A3. *The heavy aluminum base assembly crimped to the outer tube sits in the water and causes the candle to sit out of the water.*
- A4. *The Mk 25 and Mods marine location marker is launched by hand or by sonobuoy launcher.*
- A5. *The Mk 34 adapter kit is used when the Mk 25 and Mods marine location marker is launched from sonobuoy launchers.*
- A6. *The Mk 58 Mod 1 marine location marker is used for antisubmarine warfare, search-and-rescue operations, man-overboard markings, and as a target for practice bombing at sea.*
- A7. *The Mk 58 Mod 1 marker produces a yellow flame and white smoke for 40 to 60 minutes.*
- A8. *Under normal conditions, the flame and/or smoke of the Mk 58 Mod 1 marker is visible for 3 miles.*
- A9. *The Mk 58 Mod 1 marine marker is hand launched, externally launched from aircraft bomb racks, or launched from sonobuoy launchers.*
- A10. *The Mk 72 Mod 1 seawater-activated battery is used with the Mk 58 Mod 1 marker.*

impact and fuze function. Three types of signal cartridges are discussed in this section.

Mk 4 Mod 3 signal cartridge. The Mk 4 Mod 3 practice bomb signal cartridge (fig. 4-13) consists of an aluminum case. The rim end has a percussion primer, and the opposite end is sealed with an aluminum disk. The cartridge produces a flash of light and a white smoke puff. The Mk 4 Mod 3 is primarily used for night operations.

CXU-3/B and CXU-3A/B signal cartridges. The CXU-3/B and CXU-3A/B practice bomb signal cartridges (fig. 4-14) consists of a cylindrical aluminum case. The case is closed on one end with a percussion primer, and the opposite end is closed with a crimped-in-place aluminum cover (cap). The cartridge produces a dense, white smoke display for day missions.

CXU-4/B spotting charge. The CXU-4/B spotting charge (fig. 4-15) is a fire-free signal used with practice bomb BDU 45/B to provide a daytime visual indication of bomb impact point and fuse function.

REVIEW NUMBER 4

- Q1. Describe the primary purpose of decoy flares.
- Q2. What means are used to launch the Mk 46 Mods 1, 1A, and 1C decoy flares?
- Q3. What cartridge is used to fire a decoy flare from a chaff dispenser?
- Q4. What practice bomb signal cartridge is used primarily for night operations?
- Q5. What practice bomb signal produces white smoke for day missions?

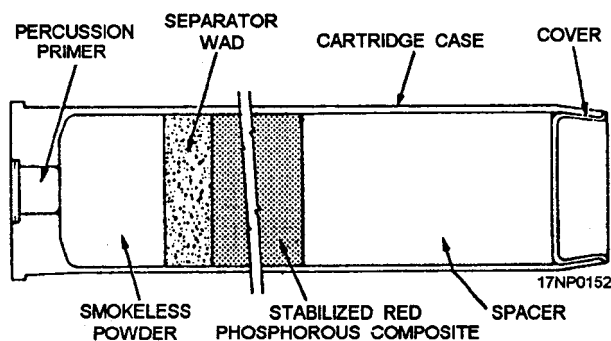


Figure 4-13.—Practice bomb signal cartridge.

LENGTH:
MK 4 MOD 3: 5 IN.
CXU-3/B AND 3A/B: 6 IN.
DIAMETER: 0.85 IN.

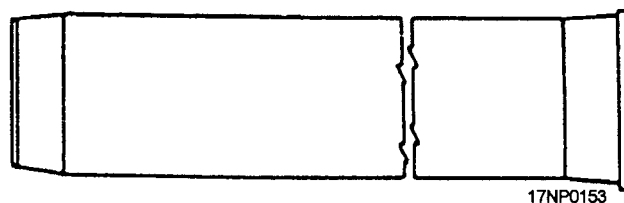


Figure 4-14.—Mk 4 Mod 3, CXU-3/B, and CXU-3A/B practice bomb signal cartridge.

HANDLING AND SAFETY PRECAUTIONS

LEARNING OBJECTIVE: *Recognize the safety precautions to follow when working with pyrotechnics.*

Pyrotechnic ammunition is one of the most widely used types of ammunition in naval aviation. Pyrotechnics of one type or another are carried in almost every Navy aircraft, including unarmed transport and training aircraft.

All pyrotechnic and screening devices, while designed and tested to be safe under normal conditions, are subject to accidental ignition. A general rule for the handling of pyrotechnic devices is as follows:

You should be constantly aware that pyrotechnics contain chemical components that are intended to burn with intense heat, and you should act accordingly.

LENGTH: 2.85 IN.
DIAMETER: 2 IN.

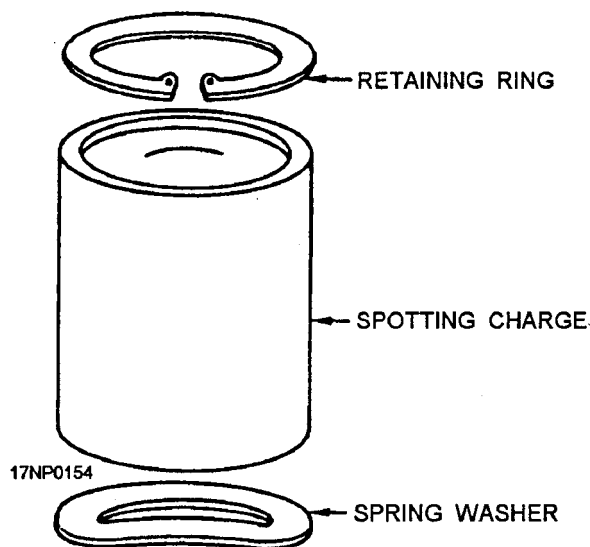


Figure 4-15.—CXU-4/B spotting charge.

Pyrotechnic and screening devices are normally equipped with some type of safety pin, lock, or tape that is designed to prevent accidental activation of the initiation mechanism. Do **NOT** tamper with such equipment. Do **NOT** strike, bend, or otherwise remove the safety equipment until just before the device is launched. Any devices that show signs of damage to the safety features are considered unserviceable; carefully put them to one side and promptly dispose of them according to current directives.

If a pyrotechnic device should accidentally ignite, it will result in a fire hazard. In a confined area, the gases generated by this combustion could present a serious toxic hazard. Signaling charges that contain propellant charges, designed to propel the pyrotechnic candle into the air, create an extremely dangerous missile hazard.

Pyrotechnic compositions characteristically contain their own oxidants; therefore, they do not depend on atmospheric oxygen for combustion. For this reason, exclusion of air, by whatever means, from a pyrotechnic fire is usually ineffective. Many pyrotechnic mixtures, particularly illuminating flare compositions, burn with intense heat (up to 4,500°F). Normally, extinguishers are not useful in this kind of fire. Carbon dioxide extinguishers, in addition to being ineffective, are potential sources of danger because they tend to produce oxygen, which supports the combustion. Foam-type extinguishers are equally ineffective because they work on the exclusion-of-air principle.

Water, in flooding quantities and at low pressure, should be used to cool the surrounding area and to prevent the spread of the fire. Properly controlled and directed, water is the best fire-extinguishing agent for aircraft parachute flares burning in the open.

Pyrotechnic hazards are frequently increased by such factors as age, improper storage conditions, rough handling, moisture penetration, excessive temperatures, damage to shipping containers, and other mishaps that causes the devices to become unserviceable. In most cases, immediate danger does not exist. Unserviceable pyrotechnic and screening devices on ships at sea are put to one side for normal return to an appropriate shore station for disposition according to the instructions and regulations contained in NAVSEA OP 5, volume 1.

Conditions may develop that demand emergency disposal of potentially hazardous devices. In such cases, disposition is the responsibility of the commanding officer. Under **NO** circumstances, other than an extreme emergency, should ammunition, explosives, or other related hazardous materials be dumped at sea by a Navy vessel, aircraft, or activity without prior approval of the CNO. If, in the commanding officer's best judgement, immediate disposition is necessary to protect lives and property, the commanding officer should order such disposition by the most appropriate means available. In all cases, the commanding officer must notify Naval Sea Systems Command, at the earliest practical time, of the facts and circumstances.

REVIEW NUMBER 5

- Q1. *Pyrotechnics are dangerous to handle because they are composed of _____.*
- Q2. *Combustion requires oxygen. By what method is oxygen supplied to pyrotechnic devices?*
- Q3. *What means should you use if there is a fire involving parachute flares?*

REVIEW NUMBER 4 ANSWERS TO QUESTIONS Q1. THROUGH Q5.

- A1. *The purpose of decoy flares is to provide evasion tactics for naval aircraft when they are threatened by enemy heat-seeking missiles.*
- A2. *Mk 46 (Mods) decoy flares are launched from either the AN/ALE-39 dispenser set or the AN/ALE-37A chaff dispenser.*
- A3. *The Mk 131 impulse cartridge is used to fire a decoy flare from a chaff dispenser.*
- A4. *The Mk 4 Mod 3 signal cartridge is used primarily for practice bomb night operations.*
- AS. *The CXU-3A/B signal cartridge is used for practice bomb day missions.*

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REVIEW NUMBER 5 ANSWERS TO QUESTIONS Q1. THROUGH Q3.

- A1. *Pyrotechnics are dangerous to handle because they are composed of chemicals that are intended to burn with intense heat.*
- A2. *Combustion requires oxygen. Generally pyrotechnic devices contain their own oxygen supply; they don't depend on the atmosphere for it.*
- A3. *If there is a fire involving parachute flares, water, in flooding quantities and at low pressure should be used.*